

## COTTONWOOD BAR CHEVRON DIKES (IL-08)

### 1.0 Location

The proposed Cottonwood Bar Chevron Dike project area is located in Pope County, Illinois approximately 7.4 miles east of Paducah, Kentucky. The project site is in Ohio River Pool 52 near Ohio River Mile 925.5. The project site is within the jurisdiction of the Louisville District, U.S. Army Corps of Engineers (USACE).



### 2.0 Project Goal

The primary goal of the Cottonwood Bar restoration project is to create nesting and feeding habitat for the federally-listed endangered interior least tern (*Sterna antillarum*) by installing a chevron dike or similar structure in the Ohio River channel. In addition, installation of the structure would create habitat diversity for aquatic species such as fish and benthic invertebrates, especially the federally-listed endangered fat pocketbook pearly mussel (*Potamilus capax*).



### 3.0 Project Description and Rationale

A new island (barren sand) would be created near Cottonwood Bar in Pope County, Illinois. Following the construction of a chevron dike, river currents would create a scour hole behind the chevron dike. The displaced sand from the scour hole would be deposited downstream of the dike and scour hole, thereby creating the island.

The newly created sand island would provide least tern nesting and feeding habitat. The least tern is a federally-listed endangered species.

### 4.0 Existing Conditions

**Terrestrial/Riparian Habitat:** The Illinois bank of the Ohio River near ORM 925.5 is covered by a dense stand of young (<20-inch dbh) trees. The dominant species include black willow (*Salix nigra*), cottonwood (*Populus deltoides*), and silver maple (*Acer saccharinum*).

**Aquatic Habitats:** The proposed location of the Cottonwood Bar chevron dike would be in the main channel of the Ohio River near ORM 925.5 approximately 150 yards from the Illinois bank and 300 yards from the Kentucky bank. At this location the average water depth is approximately 5-6 feet. Proceeding to the northwest toward the Illinois bank, the water depth increases to approximately 12 feet and then the water depth gradually decreases to the Illinois shoreline. From the proposed dike location proceeding to the southeast toward the Kentucky shoreline, the water depth gradually increases into the Ohio River navigation channel. The bottom substrate is composed of fine to coarse sand, and there is very little habitat diversity in the vicinity of the proposed project.

**Wetlands:** There are no jurisdictional wetlands present in the immediate vicinity of Cottonwood Bar. Wetlands in the vicinity of the proposed Cottonwood Bar chevron dike would be restricted to the bottomland hardwoods associated with the riparian zone adjacent to the Ohio River. Since the chevron dike would be constructed in the main channel of the Ohio River (over 100 yards from the Illinois bank and 300 yards from the Kentucky bank), there would be no effects to jurisdictional wetlands.

**Federally-Listed Threatened and Endangered Species:** According to the U.S. Fish and Wildlife Service (USFWS), there are five federally-listed threatened and endangered species known to occur in Pope County, Illinois and one species that is listed as a species of concern under a candidate conservation agreement (Table 1).

Table 1. Federally-listed species known to occur in Pope County, Illinois.			
Common Name	Scientific Name	Federal Status	Habitat Present
Bald eagle	<i>Haliaeetus leucocephalus</i>	threatened	yes
Interior least tern	<i>Sterna antillarum</i>	endangered	yes
Gray bat	<i>Myotis grisescens</i>	endangered	no
Indiana bat	<i>Myotis sodalis</i>	endangered	yes
Fat pocketbook pearly mussel	<i>Potamilus capax</i>	endangered	yes
Copperbelly watersnake	<i>Nerodia erythrogaster neglecta</i>	not listed (species of concern under a conservation agreement)	yes
Source: Parsons Engineering Science, 1999			

The primary goal of the Cottonwood Bar restoration project is to create nesting and feeding habitat for the federally-listed endangered interior least tern (*Sterna antillarum*). According to the IDNR, least terns are known to nest on an unvegetated portion of Cottonwood Bar approximate one mile south of the proposed chevron dike location.

**Illinois State-Listed Species:** According to the Illinois Department of Natural Resources (IDNR) database, there are many state-listed-species known to occur in Pope County, Illinois. The database listings for Pope County are attached in Appendix A

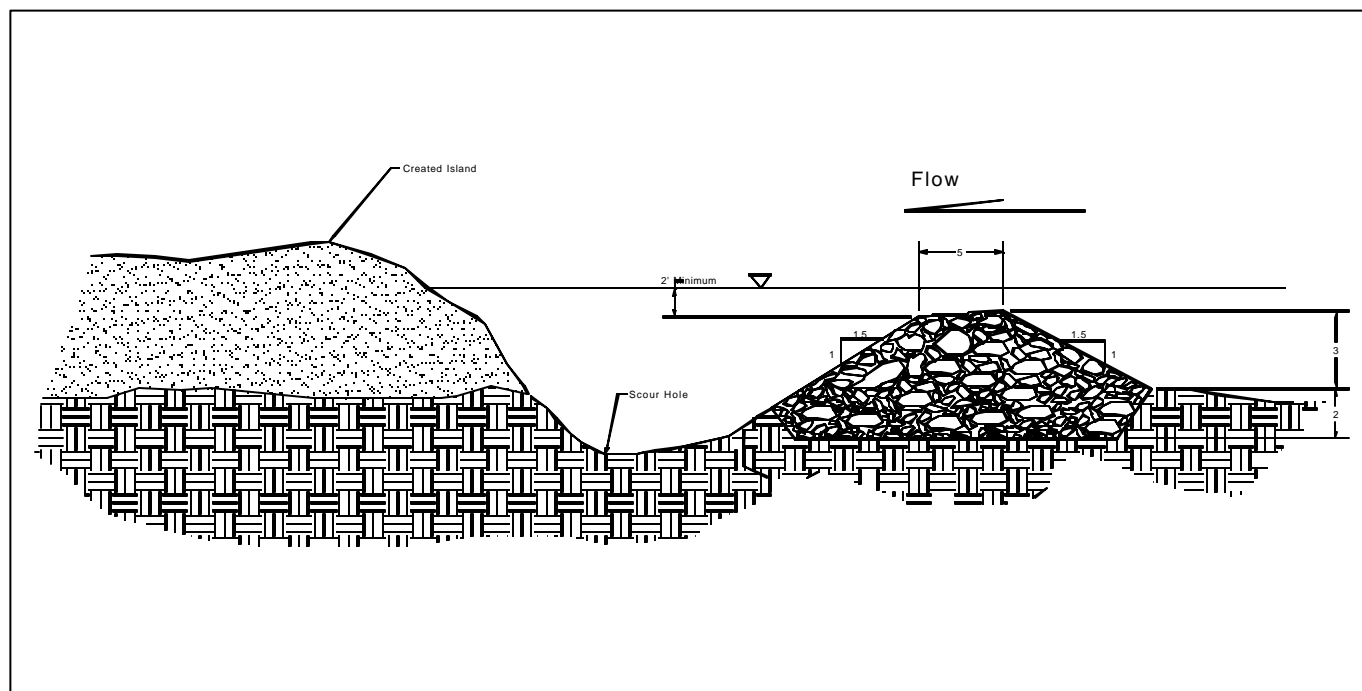
## 5.0 Engineering Design and Requirements

A chevron dike is a large rock “U” or “V” shaped structure, which is placed in the shallow side of the river channel pointing upstream. The structure creates a scour hole immediately downstream, and the sediment is deposited in the slack water downstream from the scour hole forming an island. Figure 1 illustrates a typical section of a chevron dike.

### Design Requirements:

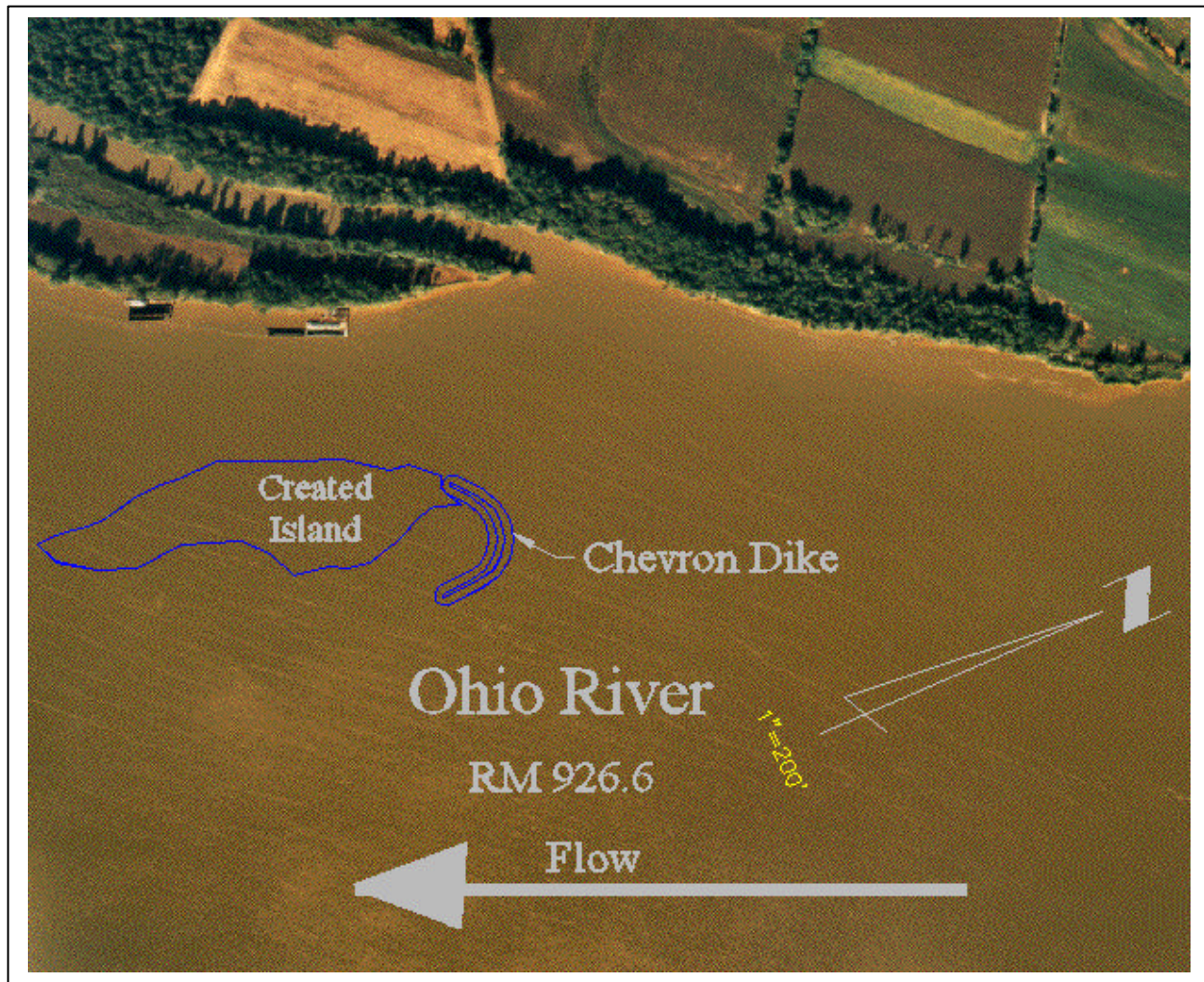
- ? Total length of the dike is 350 feet.
- ? The top width is 5 feet with 1.5 to 1 side slopes.
- ? The dike shall be toed into the sub-grade a minimum of 2 feet and stand above the normal river bottom 3 feet.
- ? The top of the structure shall be a minimum of 2 feet below the normal pool elevation of 302.0.
- ? The size of rock used shall be uniformly graded limestone with all rocks weighing between 50 and 150 pounds. Normally a well-graded rock would be used, however, a uniform gradation would provide better aquatic habitat.

**Figure 1. Typical Section of a Chevron Dike**





## 6.0 Project Diagram



## 7.0 Planning/Engineering Assumptions

Assumptions for the project are listed as follows:

- ? Average channel velocities are 3 feet per second.
- ? All rip-rap material would be shipped by barge to the job site. All costs for shipping are included in the material costs.

## 8.0 Cost Estimate (Construction and Land Acquisition)

Engineering costs for the project are contained on Table 2. A detailed Micro Computer-Aided Cost Engineering System (MCACES) cost estimate for the proposed project is provided in Appendix D.

<b>Table 2. Engineering Costs.</b>	
<b>Item</b>	<b>Cost</b>
Excavation	\$16,400
Rip-rap	\$30,000
Mobilization and Contingencies @ 20%	\$9,300
<b>TOTAL</b>	<b>\$55,700</b>

## 9.0 Schedule: Cottonwood Bar Chevron Dike

The estimated construction time for this project is found on Table 3.

<b>Table 3. Construction Schedule.</b>	
<b>Item</b>	<b>Time</b>
Mobilization	2 Days
Excavation	3 Days
Chevron Dike	11 Days
<b>TOTAL</b>	<b>16 Days</b>

## 10.0 Expected Ecological Benefits

**Terrestrial/Riparian Habitat:** Since the Cottonwood Bar chevron dike would be constructed over 100 yards from the Illinois bank of the Ohio River, there would be no impacts to terrestrial or riparian habitats. During construction of the chevron dike, there would be a potential for short-term adverse impacts to terrestrial species from construction related noise and disturbance. Considering the existing high volume of disturbance from barge and recreational boat traffic along the Ohio River, it is likely that the increased noise/disturbance impacts would be very minor.

**Aquatic Habitats:** The structure of the rip-rap dike, coupled with localized changes in flow patterns and the scouring effects downstream from the dike, would lead to improved habitat diversity for aquatic species. At the proposed location of the Cottonwood Bar chevron dike there appears to be little habitat diversity. The aquatic habitat in the immediate vicinity of the proposed dike location is characterized by a shallow (<6 feet deep), broad flat with a relatively consistent sand and silt substrate. The shallow sand flat is over 100 yards wide near the proposed dike location, and, based upon observations made at the site, the area appears to be uniform in depth with little variability in the bottom elevation.

**Wetlands:** There would be no reasonably foreseeable beneficial impacts to jurisdictional wetlands as a result of constructing the Cottonwood Bar chevron dike.

**Federally-Listed Threatened and Endangered Species:** Following the construction of the Cottonwood Bar chevron dike, it is anticipated that the effects of the Ohio River currents flowing over the chevron dike during high flow periods would result in the formation of a scour hole immediately downstream from the dike. The sediment/sand from the scour hole is expected to form an island immediately downstream from the scour hole, which would be exposed during low flow conditions. The formation of this island would create long-term beneficial impacts for the interior least tern, which utilizes similar habitats (unvegetated sand islands) for feeding, nesting, and brood habitat (USFWS, 1990). Placement of the chevron dike greater than 100 yards from either bank of the Ohio River would greatly reduce the potential for nest depredation from ground predators, especially raccoons.

In addition to the benefits associated with the increased amount of habitat available to the least tern, the effects to the altered bathymetry of the aquatic environment may be beneficial for benthic invertebrates including the fat pocketbook pearly mussel. According to the USFWS recovery plan for the fat pocketbook pearly mussel, this species has been identified near the confluence of the Cumberland and Ohio Rivers which is immediately upstream from the proposed chevron dike location. Although life history information for the fat pocketbook pearly mussel is limited, it is believed that this mussel is a large river species that requires flowing water and a stable substrate. This mussel may be found on a mixture of sand, silt, and gravel (USFWS, 1989). The complex nature of the rip-rap structure from the dike coupled with localized changes in flow patterns and the scouring effects downstream from the dike could lead to improved habitat for the fat pocketbook pearly mussel and similar species.

The creation of the chevron dike and anticipated sand island would be beneficial to bald eagles, which frequently utilize islands along major rivers for hunting/scavenging activities. Similar river islands also provide eagles with temporary perching/loafing locations that are free from disturbance.

There would be no reasonably foreseeable beneficial impacts to Indiana bats, gray bats, or copperbelly watersnakes as a result of constructing the Cottonwood Bar chevron dike.

**Illinois State-Listed Species:** The only state-listed species that could be impacted by the proposed project would be the ebonyshell (*Fusconaia ebena*), which is a freshwater mussel that is a species of special concern in Illinois. In addition to the ebonyshell, there are several state and federally-listed species of freshwater mussels in Massac County, Illinois, which is downstream from the proposed project area in Pope County, Illinois. Beneficial impacts to state-listed freshwater mussels would be similar to those impacts discussed above for the fat pocketbook pearly mussel.

**Socioeconomic Resources:** There would be short-term beneficial impacts to socioeconomic resources as a result of constructing the Cottonwood Bar chevron dike. The short-term beneficial impacts would be related to costs and local expenditures associated with the construction and dredging operation.

## 11.0 Potential Adverse Environmental Impacts

**Terrestrial/Riparian Habitat:** Since the Cottonwood Bar chevron dike would be constructed over 100 yards from the Illinois bank of the Ohio River, there would be no adverse impacts to terrestrial or riparian habitats. During construction of the chevron dike, there would be a potential for short-term adverse impacts to terrestrial species from construction-related noise and disturbance. Considering the existing high volume of disturbance from barge and

recreational boat traffic along the Ohio River, it would be likely that the increased noise/disturbance impacts would be very minor.

**Aquatic Habitats:** There would be a potential for adverse affects to aquatic species, especially immobile benthic invertebrates during the construction of the Cottonwood Bar chevron dike. Localized populations of benthic invertebrates could be covered with rip-rap during the construction of the dike. In addition, sensitive aquatic species immediately downstream from the construction site could be adversely impacted by degraded water quality conditions associated with displaced sediments. Adverse impacts to aquatic species would be short term, and the overall beneficial impacts of the restoration project would make the adverse impacts inconsequential.

**Wetlands:** There would be no adverse effects to jurisdictional wetlands as a result of constructing the Cottonwood Bar chevron dike.

**Federally-Listed Threatened and Endangered Species:** There would be a potential for adverse effects to the fat pocketbook pearly mussel during the construction of the Cottonwood Bar chevron dike. If present, individual mussels or localized populations could be covered with rip-rap during the construction of the dike. In addition, mussels immediately downstream from the construction site could be adversely impacted by degraded water quality associated with displaced sediments. Adverse impacts to fat pocketbook pearly mussels could be minimized by conducting surveys and potentially relocating the endangered mussels prior to construction.

It is unlikely that the Indiana bat, gray bat, bald eagle, copperbelly watersnake, or the interior least tern would be adversely affected by the construction of the Cottonwood Bar chevron dike.

**Illinois State-Listed Species:** According to the Illinois Department of Natural Resources (IDNR) database, there are many state-listed-species known to occur in Pope County, Illinois, and these species are listed in Appendix A. The only state-listed species that could be adversely impacted by the proposed project would be the ebonyshell (*Fusconaia ebena*), which is a freshwater mussel that is a species of special concern in Illinois. In addition to the ebonyshell, there are several state and federally-listed species of freshwater mussels in Massac County, Illinois, which is downstream from the proposed project area. Adverse impacts to state-listed freshwater mussels would be similar to those impacts discussed above for the fat pocketbook pearly mussel.

**Socioeconomic Resources:** There would be no reasonable foreseeable adverse socioeconomic impacts as a result of constructing the Cottonwood Bar chevron dike.

## 12.0 Mitigation

No significant adverse impacts are expected from the construction of the chevron dike and the creation of the new island. Conducting surveys and potentially relocating any endangered mussels prior to construction and island creation could minimize adverse impacts to unionid mussels.

## 13.0 Preliminary Operation and Maintenance Costs

Operation and Maintenance costs are summarized on Table 4.

Table 4. Operation and Maintenance Costs.		
Maintenance	Frequency	Costs
Repair of Chevron Dike	10 Years	\$9,000

#### 14.0 Potential Cost Share Sponsor(s)

- ◆ State of Illinois
- ◆ U.S. Army Corps of Engineers
- ◆ U.S. Fish & Wildlife Service
- ◆ The Nature Conservancy
- ◆ Barge/towing industry

#### 15.0 Expected Life of the Project

After construction of the chevron dike, island formation would begin. As long as the chevron dike is in place the island would remain. It is anticipated that the chevron dike will have a life expectancy of 50 years.

The new island would function as least tern habitat as long as the island remains predominantly unvegetated. If willows and other riparian vegetation become abundant on the island the value of the island habitat for least terns would diminish. The expected time period that the island would be useful to least terns is directly related to vegetative succession (if any) on the island. A life expectancy of 10-50 years is expected.

#### 16.0 Hazardous, Toxic, and Radiological Waste Considerations

Potential impacts of hazardous, toxic, and radiological waste (HTRW) at the site were visually assessed during a site visit and further assessed via a database search of HTRW records in the site area.

**Site Inspection Findings.** The project site is within the Ohio River at River Mile 126 and east of the north end of Cottonwood Bar. Pope County, Illinois is on the west side of the river and Livingston County, Kentucky is east of the river. The towns of Ledbetter, Kentucky and New Liberty, Illinois are respectively situated about 2.25 miles south-southwest and 3.25 miles north of the project site.

The following environmental conditions were considered when conducting the June 3, 1999 project area inspection:

- |                                      |                             |
|--------------------------------------|-----------------------------|
| ◆ Suspicious/Unusual Odors;          | ◆ Impoundments/Lagoons;     |
| ◆ Discolored Soil;                   | ◆ Drum/Container Storage;   |
| ◆ Distressed Vegetation;             | ◆ Electrical Transformers;  |
| ◆ Dirt/Debris Mounds;                | ◆ Standpipes/Vent pipes;    |
| ◆ Ground Depressions;                | ◆ Surface Water Discharges; |
| ◆ Oil Staining;                      | ◆ Power or Pipelines;       |
| ◆ Above Ground Storage Tanks (ASTs); | ◆ Mining/Logging;           |
| ◆ Underground Storage Tanks (USTs);  | ◆ Other                     |
| ◆ Landfills/Wastepiles;              |                             |

None of the environmental conditions listed above were observed in the project area. A commercial sand/gravel dredging operation was observed on the Kentucky side of the river at the mouth of Goodlow Slough (KY) directly adjacent to the project site.

**Risk Management Data Search.** A search of available environmental records was conducted by Environmental Data Resources, Inc. (EDR). The search complied with ASTM Standard Practice for Environmental Site Assessments, E 1527-97. The search report with maps showing the search area around the project site is presented in Appendix B. The search distance was configured to include the area of the project and an extended buffer zone beyond the boundary of the project. It was conservatively assumed that any environmental conditions beyond the



project area buffer zone would not impact the project. Databases searched and the distance searched from the project site for each environmental item (e.g., USTs, NPL sites, etc.) are as follows:

<b>Databases</b>	<b>Search Radius (Miles)</b>
<b>NPL:</b> National Priority List	1.50
<b>RCRIS-TSD:</b> Resource Conservation and Recovery Information System	1.00
<b>SHWS:</b> State Hazardous Waste Sites	1.50
<b>CERCLIS:</b> Comprehensive Environmental Response, Compensation, and Liability Information System	1.00
<b>CORRACTS:</b> Corrective Action Report	1.50
<b>SWF/LF:</b> Available Disposal for Solid Waste in Illinois- Solid Waste Landfills Subject to State Surcharge	1.00
<b>LUST:</b> Leaking Underground Storage Tank	1.00
<b>UST:</b> Underground Storage Tank	0.75
<b>RCRIS-SQG:</b> Resource Conservation and Recovery Information System for Small Quantity Generators	0.75
<b>RCRIS-LQG:</b> Resource Conservation and Recovery Information System for Large Quantity Generators	0.75
<b>ROD:</b> Record of Decision	1.50
<b>CONSENT:</b> Superfund (CERCLA) Consent Decrees	1.50
<b>Coal Gas:</b> Former Manufactured gas (Coal Gas) Sites	1.50
<b>MINES:</b> Mines Master Index File	0.75

None of the conditions listed above were found in or around the project area at the distances specified. Site maps produced by the search show an oil and gas pipeline crossing the river about 1.25 miles upstream of the project site.

### **HTRW Findings and Conclusions**

An inspection of the project site and a search of environmental records relevant to the project site, and within the search radius, have revealed no evidence of recognized HTRW conditions in connection with this project site.

**17.0 Photo Log**



Ohio River near proposed new island



Ohio River near proposed new island



Existing Ohio River Sand Island



Dredging Operation near project site

**APPENDIX A      Threatened and Endangered Species**

**APPENDIX B            Hazardous, Toxic, and Radiological Waste Database Search**

**APPENDIX C            Plan Formulation and Incremental Analysis****Project Site Location:** (Include enough description or landmarks to find).

Cottonwood Bar Chevron Dike project area is located in Pope County, Illinois approximately 7.4 miles east of Paducah, Kentucky. The project site is in Ohio River Pool 52 near Ohio River Mile 925.5.

**Description of Plan selected:**

Construct a chevron dike that will produce an island by scouring sand behind the chevron dike and depositing the sand downstream of the dike thereby creating the island. The newly created barren sand island will provide nesting and feeding habitat for the federally-endangered least tern.

**Alternatives of the Selected Plan:**

**Smaller Size Plans Possible?                      Yes / No            and description**

**Larger Size Plan Possible?                      Yes / No            and description**

Additional chevron dikes could be constructed to create more islands.

**Other alternatives?**

**Restore/Enhance/Protect Terrestrial Habitats?** ☐ Yes ☐ Objective numbers met ☐ T2, T4

**Restore, Enhance, & Protect Wetlands?** ☐ Objective numbers met ☐

**Restore/Enhance/Protect Aquatic Habitats?** ☐ Yes ☐ Objective numbers met ☐ A3, A6

**Type species benefited:**

Least tern and other shore birds and wading birds. Habitat creation potentially beneficial to some unionid mussels and fish species.

**Endangered species benefited:**

Least tern and fat pocketbook pearly mussel.

**Can Estimated amount of habitat units be determined:**

**Plan acceptable to Resources Agencies?**

**U.S. Fish & Wildlife Service?**

**State Department of Natural Resources?** Yes – Illinois DNR

**Plan considered complete?                      Connected to other plans for restoration?**

**Real Estate owned by State Agency?**      Yes (Waters of the State)      **Federal Agency?**

**Real Estate privately owned?**

**If privately owned, what is status of future acquisition?**



**Does this plan contribute significantly to the ecosystem structure or function requiring restoration? What goal or values does it meet in the Ecosystem Restoration Plan?**

Island creation, habitat diversity, and creation of habitat for endangered species.

**Is this restoration plan a part of restoration projects planned by other agencies? (i.e. North American Waterfowl Management Plan, etc.)**

No

**In agencies opinion is the plan the most cost effective plan that can be implemented at this location?**

**Can this plan be implemented more cost effectively by another agency or institution?**

**Yes / No**

**Who:**

**From an incremental cost basis are there any features in this plan that would make the project more expensive than a typical project of the same nature? For embayment type plans is there excessive haul distance to disposal site? More expensive type disposal? Spoil that requires special handling/disposal?**

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**Potential Project Sponsor:**

**Government Entity:** \_\_\_\_\_

**Non-government Entity** \_\_\_\_\_

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Corps Contractor \_\_\_\_\_ Date \_\_\_\_\_

U.S. Fish & Wildlife Representative \_\_\_\_\_ Date \_\_\_\_\_

State Agency Representative \_\_\_\_\_ Date \_\_\_\_\_

U.S. Army Corps of Engineers Representative \_\_\_\_\_ Date \_\_\_\_\_

## **Terrestrial Habitat Objectives**

- T1 Riparian Corridors
- T2 Islands
- T3 Floodplains
- T4 Other unique habitats (canebrakes, river bluffs, etc.)

## **Wetland Habitat Objectives**

- W1 Forested Wetlands: Bottomland Hardwoods
- W2 Forested Wetlands: Cypress/Tupelo Swamps and other unique forested wetlands
- W3 Scrub/Shrub Emergent Wetlands: isolated from the river except during high water and contiguous (includes scrub/shrub wetlands in embayments and island sloughs)

## **Aquatic Habitat Objectives**

- A1 Backwaters (sloughs, embayments, oxbows, bayous, etc.)
- A2 Riverine submerged and aquatic vegetation
- A3 Sand and gravel bars
- A4 Riffles/Runs (tailwaters)
- A5 Pools (deep water, slow velocity, soft substrate)
- A6 Side Channel/Back Channel Habitat
- A7 Fish Passage

**APPENDIX D          Micro Computer-Aided Cost Engineering System (MCACES)**